13.3 FREQUENCY DISTRIBUTIONS

Mathematical Concepts

March 26, 2009

A **piece of data** is a single response to an experiment.

A **frequency distribution** is a listing of the observed values and the corresponding frequency of occurrence of each value.

The number of children per family is recorded for 64 families surveyed. Construct a frequency distribution of the following data:

$$
\begin{array}{cccccccc}
0 & 1 & 1 & 2 & 2 & 3 & 4 & 5 \\
0 & 1 & 1 & 2 & 2 & 3 & 4 & 5 \\
0 & 1 & 1 & 2 & 2 & 3 & 4 & 6 \\
0 & 1 & 2 & 2 & 2 & 3 & 4 & 6 \\
0 & 1 & 2 & 2 & 2 & 3 & 4 & 7 \\
0 & 1 & 2 & 2 & 3 & 3 & 4 & 8 \\
0 & 1 & 2 & 2 & 3 & 3 & 5 & 8 \\
0 & 1 & 2 & 2 & 3 & 3 & 5 & 8
\end{array}
$$

Construction is carried out by listing the number of children (observed values) and the number of families (frequency).

The frequency distribution is:

Number of Children (Observed Values)	Number of Families (Frequency)
0	8
1	11
2	18
3	11
4	6
5	4
6	2
7	1
8	2
9	1
	64

Often data are grouped in classes to provide information about the distribution that would be difficult to observe if the data were ungrouped.

Rules for data grouped by classes:

- ► The classes should be of the same "width."
- ► The classes should not overlap.
- ► Each piece of data should belong to only one class.

The following set of data represents the family income (in thousands of dollars, rounded to the nearest hundred) of 15 randomly selected families.

31.5	16.8	30.8	29.7	25.9
50.2	37.4	29.6	38.7	33.8
20.5	25.3	24.8	41.3	35.7

Construct a frequency distribution with the first class of 16.5-22.6.

- ▶ The first class goes from 16.5 to 22.6. We call 16.5 is the **lower class limit** whereas 22.6 is the **upper class limit**.
- ▶ Since the data are in tenths, the class limits will also be given in tenths.
- ▶ The first class ends with 22.6; therefore, the second class must start with 22.7.
- ▶ The **class width** of the first class is $22.7 - 16.5 = 6.2$. The upper class limit of the second class must therefore be $22.6 + 6.2 = 28.8$.

The rest of the classes are: (largest piece of data is within the last class)

16.5	-	22.6
22.7	-	28.8
28.9	-	35.0
35.1	-	41.2
41.3	-	47.4
47.5	-	53.6

The frequency distribution is:

Income ($1000)	Number of Families
16.5- 22.6	2
22.7-28.8	3
28.9-35.0	5
35.1-41.2	3
41.3-47.4	1
47.5 - 53.6	1
	15

The **modal class** of a frequency distribution is the class with the greatest frequency.

The **midpoint of a class (class mark)** is found by adding the lower and upper class limits and dividing the sum by 2.